

We claim:

1. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture, the closure device comprising:

a filament extending from a first end of the closure device;

a nest comprising a first surface;

an anchor for insertion through the tissue wall puncture seated in the nest and attached to the filament at the first end of the closure device; the anchor having a first surface;

a sealing plug slidingly attached to the filament adjacent to the anchor;

a gap between the nest and a portion of the anchor.

2. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 1 wherein the nest further comprises a second surface spaced from the first surface of the anchor, the spacing between the first surface of the anchor and the second surface of the nest defining the gap.

3. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 2 wherein the first and second nest surfaces are approximately parallel to one another.

4. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 2, further comprising a carrier tube, wherein the first nest surface comprises a first portion of the carrier tube compressed to a first depth, and the second nest surface comprises a second portion of the carrier tube compressed to a second depth.

5. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 4 wherein the second depth is deeper than the first depth.

6. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 4, further comprising a third nest surface, wherein the third nest surface comprises a third portion of the carrier tube compressed to a third depth.

7. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 6 wherein the third depth is deeper than the second depth.

8. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 1, further comprising an insertion sheath receptive of the closure device and having a first end.

9. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 8 wherein the first end comprises a monofold.

10. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 9 wherein the monofold fits in the gap between the nest and the anchor upon distal movement of the insertion sheath relative to the closure device.

11. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 1, further comprising a bypass tube initially disposed about the anchor to temporarily hold the anchor in the nest.

12. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture, the closure device comprising:

    a carrier tube having a split-level nest at a distal end;  
    a filament extending at least partially through the carrier tube;  
    an anchor attached to the filament at the distal end of the carrier tube and seated in the split-level nest.

13. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 12, further comprising a sealing plug disposed inside the distal end of the carrier tube.

14. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 13 wherein the sealing plug is slidingly attached to the filament.

15. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 12 wherein the split-level nest comprises a first nest surface adjacent to a first surface of the anchor, and a second nest surface spaced from the first surface of the anchor.

16. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 15 wherein the spacing between the first surface of the anchor and the second surface of the split-level nest defines a gap between the split-level nest and the anchor.

17. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 16, further comprising an insertion sheath receptive of the closure device and having a first end.

18. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 17 wherein the first end comprises a monofold in the insertion sheath.

19. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 18 wherein the monofold fits in the gap between the first and second surfaces of the split-level nest upon distal movement of the insertion sheath relative to the closure device.

20. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 12 wherein the split-level nest comprises a first portion of the carrier tube compressed to a first depth, and the second nest surface comprises a second portion of the carrier tube compressed to a second depth.

21. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture according to claim 12, wherein the split-level nest further comprises a tri-level nest.

22. A tissue puncture closure device, comprising:

- a carrier tube having a distal end;
- a sealing plug disposed inside the distal end of the carrier tube;
- a multi-level compression zone disposed in the distal end of the carrier;
- an anchor seated in the multi-level compression zone of the carrier.

23. A tissue puncture closure device according to claim 22 wherein the multi-level compression zone comprises a first compression zone at a first depth and a second compression zone at a second depth, wherein the anchor bears against the first compression zone and a first gap is formed between the anchor and the second compression zone.

24. A tissue puncture closure device according to claim 23 wherein the multi-level compression zone further comprises a third compression zone at a third depth, wherein a second gap larger than the first gap is formed between the anchor and the third compression zone.

25. A tissue puncture closure device according to claim 22, further comprising a filament extending through the carrier tube, wherein the filament is threaded through the sealing plug and the anchor.

26. A tissue puncture closure device assembly comprising:  
a carrier tube having a distal end and a filament extending therethrough;  
a sealing plug disposed inside the distal end of the carrier tube and attached to the filament;  
an anchor attached to the filament at the distal end of the carrier tube;  
a multi-level die for compressing a multi-level nest in the distal end of the carrier tube.

27. A tissue puncture closure device assembly according to claim 26 wherein the multi-level die comprises a first level and a second level, the second level being higher than the first level.

28. A tissue puncture closure device assembly according to claim 27 wherein the multi-level die further comprises a third level, the third level being lower than the first and second levels.

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29. A method of making a tissue puncture closure device, comprising:  
providing a carrier tube;  
threading a suture through the carrier tube;  
threading the suture through a sealing plug and an anchor;  
compressing a multi-level nest into a distal end of the carrier tube.

30. A method of making a tissue puncture closure device according to claim 29, further comprising nesting the anchor in the multi-level nest.

31. A method of making a tissue puncture closure device according to claim 30 wherein nesting the anchor in the multi-level nest further comprises leaving a gap between a portion of the anchor and one level of the multi-level nest.

32. A method of making a tissue puncture closure device according to claim 31 wherein compressing comprises engaging a multi-level die with the distal end of the carrier tube.

33. A method of making a tissue puncture closure device according to claim 31 wherein the multi-level nest comprises two or three different levels.

34. A tissue puncture closure device made according to the method of claim 29.

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35. A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision, comprising:

providing a tissue puncture closure device comprising a carrier tube with a filament extending therethrough, the filament connected at a distal end of the carrier tube to an anchor, the anchor seated in a multi-level nest disposed in the carrier tube, the filament also connected to a sealing plug located proximal of the anchor for disposition and anchoring about the tissue puncture;

inserting the tissue puncture closure device into the percutaneous incision;

deploying the anchor into the tissue puncture;

withdrawing the closure device from the percutaneous incision;

tamping the sealing plug toward the anchor.

36. A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 35 wherein the deploying the anchor further comprises sliding a monofold tip of an insertion sheath into a gap formed between the anchor and the multi-level nest disposed in the carrier tube.

37. A method of reducing anchor shuttle in a subcutaneous tissue puncture sealing device comprising providing a gap between a carrier tube of the tissue puncture sealing device and the anchor by creating a multi-level nest in the carrier tube or indenting the anchor.

38. A method of reducing anchor shuttle in a subcutaneous tissue puncture sealing device according to claim 37 wherein the anchor initially seats in the multi-level nest.

39. A method of reducing anchor shuttle in a subcutaneous tissue puncture sealing device, comprising providing a gap according to claim 37, further comprising coupling the puncture sealing device to an insertion sheath having a one-way valve allowing the anchor pass therethrough in a first direction, but not allowing the anchor to pass in second direction.

40. A tissue puncture closure assembly comprising a closure device for partial insertion into and sealing of an internal tissue wall puncture, the closure device comprising:

    a filament extending from a first end of the closure device;  
    an anchor for insertion through the tissue wall puncture attached to the filament at the first end of the closure device; the anchor having a first surface and a first end, wherein the first end comprises an indentation;  
    a sealing plug slidingly attached to the filament adjacent to the anchor;  
    wherein the anchor is seated in a nest comprising a first nest surface, such that the first surface of the anchor bears against the first nest surface, and wherein the indentation is spaced from the first nest surface to create a gap between the first end and the first nest surface.